Instructor:
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Office Hours: Mondays and Wednesdays from 1:30 PM to 2:20PM. Other hours by email appointment.

Course Description:
From the bulletin: Prereq: CSC 5250. Models of distributed systems, distributed synchronization, algorithms, consistency and replication models and algorithms, fault-tolerance in distributed systems.

With the huge advances in the price/performance ratio of computer hardware and with the proliferation of high speed networks, several attempts have been made at creating a truly distributed operating system to enable a new generation of computing applications that take full advantage of the new technologies, ranging from the ever-increasing "smart" mobile devices to the data centers in the Cloud. Such system would federate multiple distributed resources into a single image and allow users and applications access to these resources in a location-transparent manner.

This course is a senior graduate-level course on distributed systems. The primary objective of this course is to examine the key principles of distributed systems and to understand the protocols (including both classical and recently proposed) that are used to develop distributed systems. Students will understand the protocols and systems from both a theoretical and practical perspective and will gain hands-on experience developing a real distributed system. The topics covered in this course include: fundamentals of distributed systems, communication model, naming, fault-tolerance, caching and replication, synchronization, security, and large-scale storage systems.

Students are required actively participating in the class. In addition to a semester-long group project (2 students), each student will be asked to give a presentation of a recently published research paper (see reading list) in the class.

Credit Hours: 3 Credit Hours (Lecture only).

Prerequisite:
The only prerequisite for this course is CSC5250: Networking, Distributed and Concurrently Programming

Note: if you have not taken CSC5250 before, please see instructor before your registration.
Although not an official prerequisite, you will find the programming assignments easier to handle if you have some familiarity with some programming languages, such as Java, C/C++, and UNIX program development tools (text editors, make, etc.). I will expect you to pick up requisite knowledge of the above tools in the first few weeks of class on your own. See the course resources page for several online tutorials on these topics.

**Textbooks and Course Materials:**
The following two textbooks are considered required from which readings will be assigned:
   Andrew S. Tanenbaum, and Maarten van Steen, Prentice Hall
   Copyright 2007
2. Foundations of Computer Systems Research
   Weisong Shi, Higher Education Press
   2010 (please contact the instructor to get a copy of the book)

**Workload:**

**Class participation:** You are expected to attend all of the lectures, and actively participate in the class.

**Readings:** You are responsible for completing suggested readings; this would help both in understanding the lecture material, and in finishing your assignment.

**Homework and exam:** There will be 2 required homework assignments, one paper presentation in the class, and one midterm and one final exam during the semester, and one big project for the whole semester. The project can be done in groups of 2 students.

**Course contents:**

1) Distributed systems definition
2) Communication
3) Naming
4) Security
5) Peer-to-peer systems
6) Synchronization
7) Replication and consistency
8) Fault tolerance
9) DFS and DSM
10) New concept: Edge computing

**Course Learning Objectives:**
Upon successful completion of this class, the student will be able to:

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<th>#</th>
<th><strong>CSC 7260 Course learning Objectives</strong></th>
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<tbody>
<tr>
<td>1</td>
<td>Have an understanding of the fundamental issues in distributed computing sufficient to form a sound basis for the design and implementation of distributed systems from scratch.</td>
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<td>2</td>
<td>Understand the general properties of networked communication necessary for distributed systems programming in clusters and on the Internet</td>
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<td>3</td>
<td>Employ and create common paradigms for easing the task of distributed systems programming, such as distributed filesystems, RPC, and MapReduce. Be able to clearly elucidate their benefits, drawbacks, and limitation</td>
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4  Be able to select appropriate security solutions to meet the needs of commonly encountered distributed programming scenarios

5  Understand failure models of distributed systems and design fault-tolerant distributed systems

6  Write highly concurrent code that span multiple programs running on multicores and multiple computers

Assessment:
Homework: 10%
Hand-on project: 10%
Paper presentation: 10%
Midterm: 20%
Final exam: 20%
Project: 30%

Grading Scale:
90 – 100%  A  75 – 79%  B  60 – 64%  C  45 – 49%  D
85 – 89%  A-  70 – 74%  B-  55 – 59%  C-  40 – 44%  D-
80 – 84%  B+  65 – 69%  C+  50 – 54%  D+  Below 40%  F

************* For Graduate Students, the grading scale ends at C. *************

Course Policies:
1) Late assignments:
Assignments submitted beyond the due date will be deducted 20% points per day up to two days. Assignments that are submitted 48 hours beyond the due date will not be accepted and will receive a grade of zero. If there is an extenuating circumstance that requires an extension, the student must inform the instructor either before the assignment is due or as soon as possible. Upon request supporting documentation must be supplied.

2) Policy on Collaboration:
You are required to do the homework assignments by yourself. Collaborating with other students or copying their work will not be tolerated. Anyone found copying or using another person’s work will be dealt with under WSU’s policy on academic dishonesty http://doso.wayne.edu/academic-integrity.html. Students should also familiarize themselves with some common cheating myths that have been posted on the course website.
For the first instance of cheating, a zero will be assigned to all parties involved including the individual copying as well as the individual that provided the assignment to be copied. The instance of cheating will also be reported to the department chair for further action if needed. Further instances may result in an F for the course as well as whatever the instructor deems suitable in accordance with the WSU policy on academic integrity linked above.
However, it is strongly encouraged for students to discuss the materials covered in class. It is also acceptable to help or receive help from other students concerning features of the UNIX operating system or any other application that you use. There is a fine line between discussion and cheating. If you feel uncertain about whether you are crossing the line feel free to discuss these issues with the instructor before you do so.
For the purposes of this class, cheating is defined as:
• Copying all or part of another student’s homework
• Allowing another student to copy all or part of your homework
• Copying all or part of code found in a book, magazine, the internet, or other resource
To protect your files from being read by others on a Unix system, change their protection by executing the following command: chmod go-rx * You can make sure that all files you create are automatically protected by putting the following in your .cshrc or .profile file: umask 077

3) Class Attendance/Participation:

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Lecture attendance is mandatory. If you need to miss a lecture for a valid reason recognized by the University, you must notify me in advance of the lecture or as soon as reasonably possible. No make-up will be given for the term paper presentation without a valid reason.

Religious Holidays:
Because of the extraordinary variety of religious affiliations of the University student body and staff, the Academic Calendar makes no provisions for religious holidays. However, it is University policy to respect the faith and religious obligations of the individual. Students with classes or examinations that conflict with their religious observances are expected to notify their instructors well in advance so that mutually agreeable alternatives may be worked out.

Student Disabilities Services:
If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located in the Adamany Undergraduate Library. The SDS telephone number is 313-577-1851 or 313-202-4216 (Videophone use only). Once your accommodation is in place, someone can meet with you privately to discuss your special needs. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.

Students who are registered with Student Disability Services and who are eligible for alternate testing accommodations such as extended test time and/or a distraction-reduced environment should present the required test permit to the professor at least one week in advance of the exam. Federal law requires that a student registered with SDS is entitled to the reasonable accommodations specified in the student’s accommodation letter, which might include allowing the student to take the final exam on a day different than the rest of the class.

Academic Dishonesty - Plagiarism and Cheating:
Academic misbehavior means any activity that tends to compromise the academic integrity of the institution or subvert the education process. All forms of academic misbehavior are prohibited at Wayne State University, as outlined in the Student Code of Conduct (http://www.doso.wayne.edu/student-conduct-services.html). Students who commit or assist in committing dishonest acts are subject to downgrading (to a failing grade for the test, paper, or other course-related activity in question, or for the entire course) and/or additional sanctions as described in the Student Code of Conduct.

Cheating: Intentionally using or attempting to use, or intentionally providing or attempting to provide, unauthorized materials, information or assistance in any academic exercise. Examples include: (a) copying from another student’s test paper; (b) allowing another student to copy from a test paper; (c) using unauthorized material such as a "cheat sheet" during an exam.

Fabrication: Intentional and unauthorized falsification of any information or citation. Examples include: (a) citation of information not taken from the source indicated; (b) listing sources in a bibliography not used in a research paper.

Plagiarism: To take and use another’s words or ideas as one’s own. Examples include: (a) failure to use appropriate referencing when using the words or ideas of other persons; (b) altering the language, paraphrasing, omitting, rearranging, or forming new combinations of words in an attempt to make the thoughts of another appear as your own.

Other forms of academic misbehavior include, but are not limited to: (a) unauthorized use of resources, or any attempt to limit another student’s access to educational resources, or any attempt to alter equipment so as to lead to an incorrect answer for subsequent users; (b) enlisting the assistance of a substitute in the taking of examinations; (c) violating course rules as defined in the course syllabus or other written information provided to the student; (d) selling, buying or stealing all or part of an un-administered test or answers to the test; (e) changing or altering a grade on a test or other academic grade records.

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Course Drops and Withdrawals:
In the first two weeks of the (full) term, students can drop this class and receive 100% tuition and course fee cancellation. After the end of the second week there is no tuition or fee cancellation. Students who wish to withdraw from the class can initiate a withdrawal request on Pipeline. You will receive a transcript notation of WP (passing), WF (failing), or WN (no graded work) at the time of withdrawal. No withdrawals can be initiated after the end of the tenth week. Students enrolled in the 10th week and beyond will receive a grade. Because withdrawing from courses may have negative academic and financial consequences, students considering course withdrawal should make sure they fully understand all the consequences before taking this step. More information on this can be found at the link below: http://reg.wayne.edu/pdf-policies/students.pdf

Student services:
The Academic Success Center (1600 Undergraduate Library) assists students with content in select courses and in strengthening study skills. Visit www.success.wayne.edu for schedules and information on study skills workshops, tutoring and supplemental instruction (primarily in 1000 and 2000 level courses).
The Writing Center is located on the 2nd floor of the Undergraduate Library and provides individual tutoring consultations free of charge. Visit http://clasweb.clas.wayne.edu/ writing to obtain information on tutors, appointments, and the type of help they can provide.

Class recordings:
Students need prior written permission from the instructor before recording any portion of this class. If permission is granted, the audio and/or video recording is to be used only for the student’s personal instructional use. Such recordings are not intended for a wider public audience, such as postings to the internet or sharing with others. Students registered with Student Disabilities Services (SDS) who wish to record class materials must present their specific accommodation to the instructor, who will subsequently comply with the request unless there is some specific reason why s/he cannot, such as discussion of confidential or protected information.